

NOTES ON THE LIFE-HISTORY OF THE LARCH CASE-BEARER (COLEOPHORA LARICELLA.)

GLENN W. HERRICK.

This is an European insect that is gradually becoming quite widely distributed in the northeastern United States and parts of Canada. It is also evidently causing considerable injury to larch trees wherever it is present.

It was first noted in this country by Dr. Hagen, who, in 1886, recorded it as seriously injuring the European larches on an avenue in Northampton, Mass. In 1905, Dr. Fletcher recorded its injuries to larches in Canada and in 1906 Miss Patch says that the case-bearers have been present in certain counties in Maine and "although minute they have been present in such enormous numbers that larch trees have often been, during the past three summers, eaten bare of green early in the spring." The insect has been present on the larches in the vicinity of Ithaca for several years, and undoubtedly does considerable injury every season. The small green leaves are devoured in early spring as fast as they push out, and on many trees the green tissues are eaten out and the leaves left pale and bleached in early spring. As soon as the buds begin to break in the spring, the dark brown, cigar-like cases that have been lying quietly attached to the branches all winter, become suddenly animated and commence crawling to the tender green leaves. In the spring of 1910 we found them active and feeding by the 16th of April. Each larva selects a leaf and soon eats a circular hole through the epidermis, thus gaining access to the tender tissues within. Then holding its case at right angles to the leaf and never releasing hold of its case it mines to the right and left of the opening as far as it can reach. The mined portion of the leaf assumes a bleached appearance and the whole tree soon shows the effect of the injuries if the larvae are abundant. Observations would seem to indicate that the larvae molt just before leaving their winter quarters on the branches. This point, however, must await another season for definite determination. The cases of the larvae are enlarged after they have been feeding a few days by slitting the old case and inserting a piece of leaf in the slit and fastening it in with

silk. One larva must attack a great number of the small young leaves, for in cases observed the larvae were not abundant enough to do the damage they did unless each case-bearer attacked and injured several leaves. As bearing on this point I selected a branch 6 inches long and found that it bore 24 whorls of leaves, one whorl, at this particular stage, containing 54 small leaves and other nascent ones in the center that could not be counted. If we take 54 leaves as the average, the branch bore 1296 leaves that were of a size to be attractive to the larvae. On this branch were 10 case-bearers. They had injured every leaf on the branch except those in the last whorl evidently having begun near the base of the branch and worked outward. These ten larvae had probably attacked and injured over a thousand leaves the majority of which, of course, were small.

On April, 26th I found the first pupa in the breeding cages. When ready to pupate, the larvae attach their cases securely to the branches or to the leaves often in clusters of 4 or 5. A favorite place for attachment seems to be the center of a whorl of leaves. The period of pupation, in the breeding cages at least, proved to be from two to three weeks. We found moths emerging in the insectary May 11, 13, 15, 16 and on.

The moths begin pairing in a few days after emergence and on May 31, their pinkish-red eggs were found deposited on leaves in the breedings jars. The eggs are shaped as though moulded in a tea-cup with many ridges radiating from the upper and smaller end, for they are glued to the leaves by their bases.

On June 6th, in the field, an abundance of moths were found and many of them were pairing. Some had probably emerged a few days earlier. On June 10th I found eggs on the leaves in abundance but there were still many pupae in cases showing that the moths emerge over a long period. The eggs are evidently placed indiscriminately on either side of the leaves.

On June 28th and 29th the eggs were found hatching in the field. The egg-shells remain glued to the leaf and show no rupture of any kind for the emergence of the larva. Investigation shows that the larva bores through the base of the egg-shell and goes directly through the epidermis into the leaf beneath the egg. Here the larvae live mining in the tissues of the leaf but growing very slowly. The excrement of the tiny

larva is packed behind it in the mine. Here the larvae live until September. Owing to our absence from the University during the first part of September, we are unable to say at just what date the larvae first began to leave their mines and make their cases. On my return on the 15th of September many of them were found in their tiny cases feeding on the leaves. From this time on through September opportunity was given to observe them making their cases. In most instances, at least, they clean out their mines and pack the excrement in the outer end of it near the tip of the leaf. When the burrow is clean enough to suit them they cut off the tip of the leaf containing the excrement, which falls to the ground out of the way, and then they cut off enough of the leaf containing the clean part of the mine to make them a case of the desired length. The larvae now feed on the leaves of the larches until the latter part of October when they migrate to the branches and go into hibernation.